

What is claimed is:

1. An electron emitter comprising:

an emitter element made of a dielectric material;

5 a first electrode formed on a first surface of said emitter element; and

a second electrode formed on a second surface of said emitter element,

10 wherein a drive voltage is applied between said first electrode and said second electrode for emitting electrons from said emitter element;

at least said first electrode has a plurality of through regions, and said emitter element is exposed through said through regions; and

15 said first electrode has a peripheral surface around each of said through regions, said peripheral surface facing said emitter element and spaced from said emitter element.

20 2. An electron emitter according to claim 1, wherein at least said first surface of said emitter element has an uneven surface defined by grain boundaries of a dielectric material, and said through regions of said first electrode are formed at positions corresponding to recesses of said uneven surface.

25 3. An electron emitter according to claim 1, wherein a maximum angle  $\theta$  formed between said first surface of said

emitter element and said peripheral surface around each of said through regions facing said emitter element is in the range of  $1^\circ \leq \theta \leq 60^\circ$ .

5           4. An electron emitter according to claim 1, wherein a maximum distance  $d$  in a vertical direction between said first surface of said emitter element and said peripheral surface around each of the through regions facing said emitter element is in the range of  $0 \text{ } \mu\text{m} < d \leq 10 \text{ } \mu\text{m}$ .

10           5. An electron emitter according to claim 1, wherein floating electrodes are present on said first surface of said emitter element, at positions corresponding to said through regions.

15           6. An electron emitter according to claim 1, wherein said through regions comprise holes.

20           7. An electron emitter according to claim 6, wherein said holes have an average diameter ranging from  $0.1 \text{ } \mu\text{m}$  to  $10 \text{ } \mu\text{m}$ .

            8. An electron emitter according to claim 1, wherein said through regions comprise notches.

25           9. An electron emitter according to claim 8, wherein said through regions comprise comb-toothed notches.

10. An electron emitter according to claim 8, wherein said notches have an average width ranging from 0.1  $\mu\text{m}$  to 10  $\mu\text{m}$ .

5            11. An electron emitter according to claim 1, wherein said through regions comprise slits having an arbitrary shape.

10           12. An electron emitter according to claim 11, wherein said slits have an average width ranging from 0.1  $\mu\text{m}$  to 10  $\mu\text{m}$ .

13. An electron emitter comprising:  
an emitter element made of a dielectric material;  
15           a first electrode in contact with a first surface of said emitter element;  
a second electrode in contact with a second surface of said emitter element;  
at least said first electrode has a plurality of  
20           through regions, and said emitter element is exposed through said through regions;  
said emitter element produces an electrical condenser, and said through regions of said first electrode produce a cluster of plural electrical capacitors between said first  
25           electrode and said emitter element.